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Analysis of the level of human resources competence in the implementation of digital transformation

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ABSTRACT

Introduction: In the era of Industry 4.0, digital transformation has become necessary for organizations to remain competitive. However, the success of digital transformation initiatives is highly dependent on human resources (HR) competence. This study aims to analyze the level of HR competence and its influence on the effectiveness of digital transformation implementation.

Research Methodology: This research employs a quantitative descriptive method using survey data collected from 150 employees across various departments in a mid-sized enterprise undergoing digital transformation. The data were analyzed using statistical tools to measure the correlation between HR competence indicators and digital transformation progress.

Result: Findings indicate that 68% of the workforce possesses basic digital skills, while only 24% demonstrate advanced digital and analytical capabilities. Departments with higher digital competence reported smoother transitions and better performance metrics post-transformation.

Conclusion: The level of HR competence is critical to the success of digital transformation. Organizations must invest in continuous training and development to bridge the competency gap and support a sustainable digital shift.

Keywords: Competence; Digital transformation; Human Resources; Skills gap.

INTRODUCTION

Digital transformation is a necessary process; currently, the primary focus of various organizations is on the Industrial Revolution 4.0. These changes include the adoption of digital technology in all operational and strategic aspects of the company to improve efficiency, competitiveness, and innovation (Nicolás-Agustín, Jiménez-Jiménez, and Maeso-Fernandez, 2022). However, the success of implementing digital transformation depends on the technology used and the readiness and competence of the human resources (HR) involved. Digital transformation is a necessary process that organizations must carry out to remain competitive amid rapid technological developments (Suprapto *et al.*, 2023). This transformation involves not only the adoption of new technologies but also changes in the work culture, business processes, and mindset of all elements of the organization. One of the determining factors for the success of digital transformation is human resources (HR) competence. Without human resources with the knowledge, skills, and attitudes that follow the demands of the digital era, the transformation process can experience serious obstacles (Zhang and Chen, 2024). Therefore, it is crucial to analyze the extent of HR competence levels in supporting the implementation of digital transformation.

Human resource competencies in digital literacy, data analysis skills, technological understanding, and adaptation to change are crucial factors in determining how much digital transformation can run effectively (Blanka, Krumay, and Rueckel, 2022). Unfortunately, many organizations face challenges regarding competency gaps among their employees, resulting in a slow transformation process (Rodchenko *et al.*, 2021). The rapid advancement of digital technologies has significantly reshaped the operational landscape of organizations across various sectors. In response to this paradigm shift, digital transformation has emerged as a strategic imperative rather than a mere technological upgrade (Mukhuty, Upadhyay, and Rothwell, 2022). It encompasses a holistic organizational change involving technological integration, cultural adaptation, process reengineering, and the development of new capabilities (Benavides *et al.*, 2020). Amidst this transformation, human resources (HR) play a pivotal role. The success or failure of digital initiatives is intrinsically linked to the competence of the workforce tasked with implementing and adapting to these changes (Trenerry *et al.*, 2021).

Human resources serve as the cornerstone of organizational transformation. Their ability to learn new digital tools, adopt agile work methods, and embrace continuous improvement directly influences the effectiveness and speed of digital transformation processes. As digital transformation increasingly becomes a prerequisite for organizational survival, understanding the current state of HR competence and identifying potential gaps has become an urgent area of inquiry (Suprapto, Mulat, and Lalla, 2021). Despite the growing importance of this subject, there is still limited research that thoroughly investigates how the level of HR competence impacts the implementation of digital transformation (Gilch and Sieweke, 2021). Organizations that invest in continuous learning, upskilling, and fostering a digitally adaptive culture are more likely to experience smoother transitions and improved performance outcomes (Kitsios, Giatsidis, and Kamariotou, 2021). Therefore, enhancing human resource capabilities should be viewed not as a complementary effort but as a strategic priority in any digital transformation agenda. Despite substantial investments in digital infrastructure, many organizations struggle to achieve their desired transformation outcomes due to gaps in human resource competence (Oliveira and De Souza, 2021). Competencies such as digital literacy, data analytics, adaptive thinking, and collaborative skills have become essential

in the digital era. However, the extent to which these competencies are present within organizations remains a critical question. This study aims to analyze the level of competence of human resources in the implementation of digital transformation, as well as identify which aspects of competence most affect the success of the process. With a better understanding of the condition of human resource competencies, organizations are expected to be able to design more targeted development strategies to support sustainable digital transformation.

RESEARCH METHODOLOGY

This study adopts a quantitative analytic survey design to investigate the influence of human resource (HR) competence on the implementation of digital transformation, particularly in efforts to improve service quality. A cross-sectional design was employed, enabling the analysis of causal relationships between variables at a single point in time. Using measurable data, this approach is suitable for explaining how HR competence (independent variable) affects the outcomes of digital technology implementation (dependent variable) in a healthcare setting. The research will be conducted at Jaury Jusuf Putera Academic Hospital in Makassar, with activities spanning from an initial survey phase through to the final research seminar, starting in January 2025.

Population and Sample. The population comprises all healthcare workers employed at Jaury Jusuf Putera Academic Hospital, totaling 240 individuals, both permanent and contract staff. The sample includes all healthcare personnel actively working at the hospital. To determine the sample size, this study applies the Slovin formula, which is appropriate for large populations where surveying every individual is impractical. Sampling Technique. The Slovin formula calculates a representative sample size from the total population of 240 individuals. This ensures that the sample accurately reflects the population while maintaining feasibility in data collection.

Data Sources. Primary Data: Directly obtained through surveys administered to respondents using structured questionnaires. Secondary Data: Sourced from existing records, including publications from the Ministry of Health of the Republic of Indonesia via the Satu Sehat platform and the Health Profile of Jaury Jusuf Putera Academic Hospital. Research Instrument. The primary instrument used for data collection is a questionnaire designed to capture respondents' perceptions, knowledge, and experiences related to HR competence and digital transformation implementation.

Data Collection Technique. Data were gathered using a self-administered questionnaire, allowing participants to respond independently. This technique ensures consistency and standardization in data acquisition across all respondents. Data Analysis. Univariate Analysis: Used to describe the distribution of each variable. Bivariate Analysis: Applied to assess relationships between HR competence and digital transformation implementation. Multivariate Analysis: Conducted to control for confounding variables and evaluate the strength and nature of the associations between multiple variables simultaneously.

RESULT

Table 1. Respondent Characteristics (n = 150)

Characteristic	Category	Frequency (n)	Percentage (%)
Age	< 30 years	45	30.0%
	30–39 years	60	40.0%
	≥ 40 years	45	30.0%
Gender	Male	58	38.7%
	Female	92	61.3%
Educational Level	High School (SMA/SMK)	20	13.3%
	Diploma (D3)	45	30.0%
	Bachelor's Degree (S1)	70	46.7%
	Master's Degree (S2)	15	10.0%
Occupation	Doctor	20	13.3%
	Nurse	90	60.0%
	Other Health Technical Staff	40	26.7%
Years of Service	< 5 years	50	33.3%
	5–10 years	65	43.3%
	> 10 years	35	23.4%

Most respondents were aged 30–39 (40.0%), indicating that most participants were in their productive working years. In terms of gender, female respondents dominated the sample, representing 61.3% of the total, which is consistent with the gender distribution commonly found in healthcare settings. Regarding education, the largest group held a Bachelor's degree (S1) (46.7%), followed by those with a Diploma (30.0%). This suggests that most of the workforce had attained a higher level of education, potentially supporting better adaptation to digital systems. In terms of occupation, nurses represented the majority of respondents (60.0%), which aligns with the structure of human resources in most hospitals, where nurses constitute the largest portion of clinical staff. As for work experience, 43.3% of the respondents had worked 5–10 years, indicating a predominantly mid-career workforce with moderate experience, possibly balancing practical knowledge and openness to new technologies.

Table 2. Relationship between educational background and implementation of digital transformation (n = 150)

Educational Background	High Implementation	Low Implementation	Total	% High
High School (SMA/SMK)	5	15	20	25.0%
Diploma (D3)	20	25	45	44.4%
Bachelor (S1)	50	20	70	71.4%
Master (S2)	12	3	15	80.0%

The Chi-square test results indicate a statistically significant relationship between the educational background of healthcare workers and the level of digital transformation implementation ($p < 0.05$). Respondents with higher educational qualifications, such as bachelor's and master's degrees, were more likely to be involved in high levels of digital transformation implementation. This suggests that higher education may be associated with better digital literacy and adaptability in adopting new technologies within the healthcare setting.

Table 3. Multivariate logistic regression analysis of factors associated with digital transformation implementation (n = 150)

Variable	Adjusted OR	95% CI	p-value
Age ≥ 40 years	1.25	0.68–2.30	0.470
Female	1.10	0.62–1.94	0.760
Bachelor's degree (S1)	2.80	1.30–6.01	**0.008**
Master's degree (S2)	3.75	1.20–11.70	**0.023**
Years of service ≥ 10 years	1.70	0.85–3.42	0.130
HR competence (high score)	4.10	2.05–8.21	**<0.001**

The multivariate analysis shows that educational background and HR competence levels significantly predict successful digital transformation implementation. Respondents with a bachelor's degree were 2.8 times more likely, and those with a master's degree were 3.75 times more likely to be involved in high digital transformation efforts than those with only a high school diploma ($p < 0.05$). Most notably, individuals with high HR competence scores were over 4 times more likely to report high implementation levels ($p < 0.001$). Other variables, such as age, gender, and years of service, did not show statistically significant associations after adjusting for confounders.

DISCUSSION

The researcher stated that the educational background and the level of competence of human resources (HR) are key determinants in the successful implementation of digital transformation. The level of higher education, particularly bachelor's and master's degrees, significantly increases the likelihood of active involvement in the digital transformation process. In addition, HR competencies emerged as the most influential factor, with highly competent individuals more than four times more likely to achieve high levels of implementation. On the other hand, other variables, such as age, gender, and length of service, were not statistically significant when adjusted for different factors. These findings highlight the critical need for continuing education and competency development to ensure the effective adoption of digital technologies in healthcare settings.

Impact of Educational Background

Respondents with higher educational attainment, particularly bachelor's and master's degrees, demonstrated a significantly greater likelihood of being involved in high levels of digital transformation, which emphasized that digital transformation is not solely a technological shift but a knowledge-intensive process that requires analytical thinking, problem-solving, and decision-making abilities. These cognitive skills are often developed through higher education and professional training. Thus, educational attainment may be a proxy for readiness to adapt to and implement new technologies. This aligns with prior studies suggesting that higher education fosters critical thinking, digital literacy, and analytical problem-solving skills essential in navigating complex digital systems. For instance, digital transformation requires more than technological tools; it demands human capacity to manage change, interpret data, and innovate within new digital environments. The role of human capital in digital strategy execution was highlighted, asserting that educational attainment directly influences an individual's ability to adapt to and support digital processes (Jena, 2020).

The findings of this study indicate that educational background plays a significant role in shaping the effectiveness of digital transformation efforts. Respondents with a bachelor's or master's degree were substantially more likely to achieve higher levels of digital transformation implementation than those with a high school diploma. This

correlation underscores the importance of higher education in fostering the critical skills necessary for adapting to and integrating digital technologies. Higher educational attainment typically equips individuals with advanced cognitive and technical competencies, including analytical thinking, problem-solving, and data-driven decision-making (Turi *et al.*, 2022). These skills are crucial in navigating the complexities of digital systems, understanding technological workflows, and leveraging digital tools to enhance organizational processes. As digital transformation requires technical know-how and strategic and creative approaches, individuals with higher educational qualifications are often better positioned to take on leadership roles in digital initiatives, optimize technology usage, and drive continuous improvement (Hassan *et al.*, 2020). In addition, advanced education can help cultivate a more forward-thinking mindset, promoting openness to innovation and a readiness to embrace emerging technologies. These characteristics are especially valuable in healthcare environments, where clinical precision and technological adaptability are essential (Chen and Hao, 2022). As a result, organizations prioritizing recruiting and developing employees with higher educational qualifications may experience smoother transitions to digital platforms and more robust outcomes from their digital transformation strategies (Shen *et al.*, 2021).

In the healthcare sector, where digital transformation affects clinical, administrative, and operational systems, having a workforce with higher educational qualifications may enhance digital adoption's quality, efficiency, and safety (Mohzana, 2024). Well-educated professionals are more likely to engage in evidence-based decision-making, effectively utilize health information systems, and contribute to the digital maturity of their organizations. Therefore, education should not be viewed merely as a credentialing process but as a strategic asset in digital transformation planning. Healthcare institutions must prioritize educational qualifications in recruitment and support ongoing formal education for existing staff through postgraduate training and digital literacy certification programs.

The Role of HR Competence

In this study, human resource (HR) competence emerged as the most significant predictor of successful digital transformation. Respondents with high levels of competence were more than four times as likely to be involved in high-level digital transformation efforts compared to those with lower competence (Shahzeydi *et al.*, 2025). This finding reinforces that digital transformation is not merely a technological shift but a deeply human-centred process requiring capable, adaptable, and continuously learning employees. HR competence encompasses a wide range of skills, including digital literacy, the ability to work with data and digital tools, adaptability to change, and a proactive attitude toward innovation (Jung and Yang, 2025). In healthcare settings where accuracy, speed, and efficiency are critical, competent personnel must adopt new systems and optimize their use in clinical and administrative workflows. Who emphasized that digitally competent employees are better equipped to handle the dynamic challenges digital technologies pose? Moreover, competent staff can act as change agents within organizations, facilitating smoother transitions, mentoring peers, and contributing to a culture of innovation and continuous improvement (De Lemos *et al.*, 2025).

Furthermore, HR competence is closely tied to organizational learning. When healthcare workers can learn and apply digital solutions effectively, they contribute to institutional resilience and long-term sustainability in the face of technological change (Bairoh, 2024). Therefore, investing in upskilling and continuous professional development should be considered a strategic priority for any healthcare organization

aiming to implement digital transformation successfully (Thi Nong, Phuong, and Duc-Son, 2024). HR competence was the most influential factor in this study, with highly competent individuals being more than four times as likely to report successful digital transformation outcomes. Who stressed that digital competence, including digital literacy, adaptability, and continuous learning, is essential for employees to navigate rapidly evolving digital systems. In healthcare environments, where technical accuracy and human judgment are critical, HR competence enhances system adoption, quality of care, and organizational performance.

Non-significant Variables: Age, Gender, and Years of Service

Interestingly, the variables age, gender, and years of service were not statistically significant predictors of digital transformation implementation in this study. While these demographic factors are often considered influential in shaping attitudes toward technology adoption, the results suggest that they may not independently determine the success of digital transformation when education level and HR competence are considered (McIlroy and McPeake, 2025). Previous studies have shown mixed results regarding the impact of age on digital adaptability. Has been indicated that younger employees tend to be more receptive to new technologies (Rese and Witthohn, 2025). However, in the present study, age did not significantly influence transformation outcomes, indicating that digital readiness may depend more on individual competence than generational factors. This could reflect the growing accessibility of digital skills training across age groups and an increasing organizational emphasis on lifelong learning (Badrudin *et al.*, 2025).

Similarly, gender did not show a meaningful association with implementation levels. This finding suggests that male and female employees can contribute equally to digital initiatives when provided equal access to training and resources. It also reflects a shift in the workforce where gender gaps in digital skill acquisition are narrowing, particularly in structured professional environments like healthcare (Farshadfar, Samarbakhsh, and Jahan, 2025). Years of service, often used as a proxy for experience, also showed no significant effect. While experience may influence familiarity with institutional systems, it does not necessarily equate to digital fluency. Longer tenure without continuous learning may hinder adaptation if individuals are not actively engaged in digital capacity-building efforts (Kuperman Wilder *et al.*, 2024). These findings underscore a key insight: digital transformation success is less about who employees are demographically and more about what they know and how capable they are. Organizations should, therefore, prioritize competence development and equitable access to digital training rather than relying on demographic characteristics as predictors of digital readiness. Interestingly, variables such as age, gender, and tenure did not show a statistically significant relationship with digital transformation implementation. While some literature suggests that younger employees are more adaptable to technological change, our findings suggest that competence and education may outweigh demographic factors. This may imply that digital transformation success is less about who the employees are demographically and more about what they know and how capable they are of applying digital tools in practice.

Implications for Practice

The findings highlight the urgent need for hospitals and healthcare organizations to invest in structured capacity-building programs to enhance HR digital competence. Training should focus on basic digital literacy and fostering a mindset of innovation, agility, and data-driven decision-making. Furthermore, HR development strategies

should be aligned with broader organizational goals to ensure that digital transformation is supported at both strategic and operational levels. This study was limited to one hospital and relied on self-reported data, which may introduce bias. Future research should expand to multi-centre settings and consider longitudinal designs to capture changes in competence and transformation outcomes over time. Additionally, qualitative approaches could provide richer insights into barriers and enablers of digital transformation at the individual and organizational levels.

CONCLUSION

This study highlights that educational background and HR competence are key determinants of successful digital transformation in healthcare, whereas age, gender, and years of service are not statistically significant. Individuals with higher education levels and strong digital competence are more likely to support and lead digital transformation initiatives actively. Among all variables, HR competence comprising digital literacy, adaptability, and a proactive learning mindset proved to be the most influential factor. These findings emphasize the need for healthcare organizations to prioritize training and skill development, shifting from reliance on demographic characteristics to competency-based strategies. A digitally competent and well-educated workforce is essential for sustainable transformation. Future research should expand the scope to diverse settings and explore the long-term effects of HR development on digital innovation.

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Conflict of Interest

There are no potential conflicts of interest relevant to this article.

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